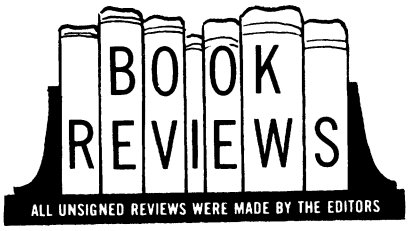

BOTANY

PLANT DIVERSITY: AN EVOLUTIONARY APPROACH, by R. F. Scagel, R. F. Bandoni, G. E. Rouse, W. B. Schofield, Janet R. Stein, and T. M. C. Taylor. 1969. Wadsworth Publishing Co., Belmont, Calif. 460 pp. $8.95 (text edition).

In the process of preparing a shortened version of their more detailed textbook of plant morphology, the authors of *Plant Morphology: an Evolutionary Approach* have retained a good many of the excellent illustrations found in the more detailed version. In some cases this has been at the expense of the accompanying text: in some chapters it would be necessary for the instructor to provide a good deal of information in support of the illustrative material.

In general, the text that is provided is well written and well organized, although coverage of some groups, particularly among the algae, is rather scanty. As pointed out by the authors, however, the book is intended for use in a single-semester course in plant morphology; thus a good deal of information had to be eliminated, in order that a wide range of topics might be covered in a short time. This sort of book is particularly useful in such a course, in that it is not necessary for the student to wade through extensive detail in order to obtain basic information.

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FLOWERING PLANTS: ORIGIN AND DISPERSAL, by Armen Takhtajan. 1969. Smithsonian Institution Press, Washington, D.C. 310 pp. $6.95.

This interesting book is a translation (excellently done by C. Jeffery) from the Russian of the second edition of Takhtajan's *The Origin of Angiospermous Plants* (1961), extensively revised and including much new material. It deals lucidly with one of the oldest and most enigmatic problems in biological history: the evolutionary origin and dispersal of angiosperms.

The first five chapters discuss general questions about the evolution of flowering plants. Do they have a common ancestor or are they a polyphyletic group? Takhtajan marshals convincing evidence that they are monophyletic. What were the ancestors like, and did they resemble any of the extant groups? The author believes the ancestors of the angiosperms must be sought among the gymnosperms. None of the extant gymnosperms are direct ancestors, but it is considered very likely that the Bennettitales and the cycads may have had a common ancestor among the seed ferns; and this ancestor probably was very similar to the ancestral type of the flowering plants. There is an interesting discussion of the significance of neoteny (the genetically controlled persistence of earlier stages of ontogeny) in plant evolution. This concept, which has been little used in the consideration of plant evolution before, is developed extensively by the author: he uses it not only to suggest the origin of angiosperms from gymnosperms but of the monocotyledons from the dicotyledons.

Chapter 6 is a detailed attempt to reconstruct a hypothetic ancestor. Takhtajan does so by analyzing the comparative morphology of vegetative organs and stomatal apparatus and the comparative anatomy of conducting systems, perianth, stamens, carpels, male and female gametophytes, and other structures. Out of this discussion a fairly clear-cut archetype of the angiosperms emerges.

Takhtajan is probably at his best in reviewing the phytogeographic and ecologic evidence for the origin of angiosperms in tropical Asia, as against evidence for their origin in high latitudes (even in the Arctic and Antarctic).

A natural classification of flowering plants is presented. It is not greatly different from that of A. Cronquist (*The Evolution and Classification of Flowering Plants,* 1968) or of R. F. Thorne (*Aliso* 6 [4]: 57-66; 1968), but enough so in its details to allow some controversy among these three experts.

The book is not extensively illustrated, but the figures and plates are appropriately chosen and sufficiently well reproduced to help the non-expert reader follow the author's main ideas. An adequate bibliography, giving current titles and the more important historical references, is included.

Among most biologists and their students the as-yet-unsolved problem of the origin of the angiosperms comes up from time to time. This clearly written discussion of the question brings our knowledge of it up to date and should be available in school libraries as a helpful reference volume.

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TREES, SHRUBS, AND WOODY VINES IN KANSAS, by H. A. Stephens. 1969. University of Kansas Press, Lawrence. 250 pp. $3.95 softback, $4.95 hardback.

As the result of much travel, fieldwork, and study, Stephens has written an excellent reference, for the general reader, to aid in the identification of the woody plants of Kansas. This book was designed primarily for use by students and teachers in elementary and secondary schools and by Boy Scouts, Girl Scouts, Campfire Girls, 4-H clubs, and naturalists in general. The information will be quite useful to people in neighboring states: many of the species discussed are not restricted to Kansas.

The work is illustrated with 883 photographs, 12 line drawings, and 114 distribution maps. The photographs, of excellent quality, were taken by the author in the field; for each species, photographs of the leaves, flowering twigs, fruiting twigs, winter twigs, and trunk are included.

A unique key provides easy identifications with a minimum of botanic terminology. In the case of difficult taxa, such as *Carya* (hickories) and *Quercus* (oaks), additional species keys and pictorial comparisons of the leaves and fruits are given. A glossary defines all technical terms used.

The book describes 114 woody species found in Kansas and lists others less frequently encountered there. Derivation of common and scientific names is given, and the cultural and economic uses of each species is discussed.

This book should be in every elementary and secondary school library in Kansas.

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CELL AND MOLECULAR BIOLOGY

ELEMENTS OF PROTEIN SYNTHESIS: AN INSTRUCTIONAL MODEL, by Thomas Peter Bennett. 1970. W. H. Freeman & Co., San Francisco. Model and pamphlet $3.00; pamphlet 75¢.

One of the key points of the molecular biology of the day is the process of translation: how the information in messenger-RNA is used to assemble amino acids in a definite sequence to construct a protein. This process is illustrated by a model developed by Bennett, of Harvard University. Judging by my limited experience with it in the classroom, the model succeeds in its task.

The kit consists of the model and a booklet of about 38 pages. The latter contains not only the directions for using the model but also a well-illustrated, intelligible, and current account of the process of translation and of some of the most important discoveries leading toward our present understanding of it.

The model itself consists of five parts: a ribosome (on which the actual assembly of the protein takes place); four different messenger-RNA pieces; an assortment of transfer-RNA units, each

visually keyed to an amino acid; an assortment of amino acid representations; and four formyl methionine units (which, as is now known, appear to act as the initiation points for bacterial protein synthesis). The units are made of heavy cardboard and, with some care, will probably stand up to student use for at least several semesters. Each unit is clearly labeled and is coded by color, and, where appropriate, by a visual symbol coordinate with that of its partner in the process. The amino acids lock into the transfer-RNA units and into each other. In the model, as in nature, the assembly is actually done on the ribosome.

The model, while quite good, is not without flaws. The transfer-RNA chips are differentiated from each other and matched with the appropriate messenger-RNA codon only by a printed symbol, such as a semicircle or a triangle, rather than by a unique fit, which could have been produced by a cut-out. Similarly, there is no unique fit between a transfer-RNA molecule and its corresponding amino acid: one must read the abbreviation printed on each to determine the fit. In only three cases—serine, leucine, and arginine—is degeneracy available; and in each of these cases it is two-fold. Finally, it would seem possible to modify the model somewhat, so that the process of transcription—that is, the formation of the messenger-RNA molecule on the basis of the order of nucleotides in the DNA—could also have been illustrated. Without this step, the messenger-RNA appears too much as a *deus ex machina*.

All in all, it is refreshing to see a good, teachable model issued by a major publisher. The model appears to be useful in high school biology courses and in introductory biology courses in college, and is ready for further improvement in an eagerly awaited second edition.

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CELLS INTO ORGANS, by J. P. Trinkaus. 1969. Prentice-Hall, Inc., Englewood Cliffs, N.J. 237 pp. $3.50 softback, $6.95 hardback.

This is another in the publisher's "Foundations of Developmental Biology" series. It is a book full of informative material; however, though the writing style is good, the author necessarily assumes a great deal of background, and sometimes the going gets rough. The author gives researchers credit by name, date, and summary.

Great emphasis is placed on cell movements in the process of morphogenesis, cell adhesion, gastrulation, and neurulation. There are bibliographies, photographs, and drawings.

Paul Klinge
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MUSCLES, MOLECULES AND MOVEMENT, by J. R. Bendall. 1969. American Elsevier Publishing Co., Inc., New York. 219 pp. $6.75.

One rarely finds a compact book on one type of tissue in which the physiology, biophysics, and biochemistry pertaining to it are so thoroughly treated. The facts are there, the theory (albeit somewhat controversial) is there, the references are there. It is well illustrated.

The treatise is well presented for the graduate student or for the teacher of undergraduates. Many undergraduate students who wish to pursue the subject to greater depth than is covered in standard texts will find it most useful and comprehensive. It is probably too comprehensive and detailed for those teachers in secondary schools who have to cover biology as a field in one year.

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EVOLUTION

THE PATTERN OF VERTEBRATE EVOLUTION, by L. B. Halstead. 1969. W. H. Freeman & Co., San Francisco. 209 pp. $7.00.

L. B. Halstead is a lecturer in the departments of geology and zoology, University of Reading, and research fellow in the department of oral anatomy, Royal Dental Hospital, London. His book shows clearly the integration of the sciences. His interesting discussion of the original roles and early evolution of tissues, bones, and dentine must be based on the author's researches.

He discusses changes in the light of conditions under which the animal existed, as disclosed by paleontology. Halstead talks about the early vertebrates and gives details and relationships of the tunicates and *Amphioxus*.

This book is not a catalogue of events but a fascinating exploration of some events and the ramifications of these events. It has enriched and amplified greatly my knowledge and understanding of evolution. It says, for example, "The amphibians are frequently given credit for making the great breakthrough in the transition from water to land. Nothing could be farther from the truth. The main interest of any amphibian during the Carboniferous was to stick to life in the wet." The book proceeds to explore this idea.

The description of the radiation of the reptilelike creatures, the function of some of the organs, the advantages in the environments, and evolution of food chains: these are among the topics Halstead focuses on. One that I found interesting was his discussion of the nasal passages of the duckbilled dinosaur. It has been said that the purpose of these passages was to allow the animal to stay under water longer, although how this is accomplished is not clear. These animals were vulnerable and could easily have become extinct long before they did; instead they were quite successful. This book suggests Ostran's idea that these passages increased the olfactory sensitivity and that this was a factor in survival.

Perhaps the last chapters giving the evolution of man are the most interesting. The author relates evolutionary history to the problems in the world today. This is excellent food for thought and ammunition to use in making students think.

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EVOLUTION OF THE VERTEBRATES, by Edwin H. Colbert. 2nd ed., 1969. John Wiley & Sons, Inc., New York. 535 pp. $12.95.

Once in a while, a reference book comes along that is wide-ranging, concise, and readable. *Evolution of the Vertebrates* is such a book. The new edition of this classic work contains updated information, new interpretations of the fossil record, and additional drawings and diagrams. Colbert continues to display his amazing ability to combine an authoritative treatment of complex material with an interesting presentation—a rare gift among scientists.

The book is not meant to be a comprehensive treatment of vertebrate paleontology. Instead, its purpose is to provide a concise summary of the generally accepted evolutionary relationships existing among the vertebrates. This is done admirably. The value of the book, especially to a biology teacher, is that it provides not only the bare essentials for reasonably quick reference, but much helpful and interesting additional information as well.

A teacher without at least some background in vertebrate history may have a little difficulty in seeing the overall relationships between some of the larger vertebrate groups. Numerous diagrams of "family trees" are included, but the task of relating the diagrams to each other may prove somewhat tedious. The teacher may also find some difficulty with terms describing the particular shape or form of a structure, such as a fish scale: diagrams that could alleviate this problem are lacking. (A paleontologist might not need a diagram to illustrate a ganoid scale; others may need to have their memories refreshed.)

There is no question as to the validity of the presentation or usefulness of this text as a reference tool. No biology teacher should be without it.

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